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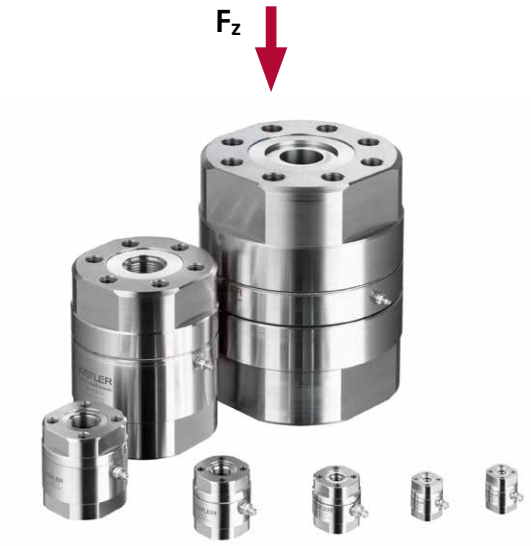
Press Force Sensor

0 … 5 N to 0 … 700 kN

Type 9323A … 9393A,
Type 9383AU0109
Type 9393AU0109

The sensors of the Press Force series are ideal for measuring both dynamic and quasistatic forces. The factory preloading and adaptability of these practical designs ensure readiness for immediate use. They come in five different sizes which are divided in seven measuring ranges.

- Compression forces from 0 ... 5 N to 0 ... 700 kN
- Each individual sensor offers an extremely wide measuring range
- Calibration certificate for 3 measuring ranges: 100 %, 10 %, 1 % and 0,1 % (Type 9323AAA only)
- SCS calibration optional
- Simple mechanical adaptation with flanges on both ends
- Easily mounted in connecting rods or press plungers
- Factor of safety against overload of up to 100 when using lowest ranges



Description

These press force sensors are based on the piezoelectric measuring principle. The force acting on the quartz element generates at the output of the sensor a proportional electric charge, which is converted by the series-connected measuring amplifier (such as ICAM Type 5073A...) into a process signal suitable for evaluation (typically 0 ...10 V). Depending on the utilized type of sensor, tension forces of up to 16 % of the compression force range can also be measured. Although uncalibrated, these ranges are often used for detecting tool withdrawal forces, for example after press-fit processes.

Applications

The flange connections at both ends allow flexible mechanical adaptation of the sensor to suit the particular machine environment. The included centering rings also facilitate axial adjustment. The rotationally symmetrical shape of the press force sensor makes it ideal for mounting in or on the end of connecting rods or press plungers.

The piezoelectric element's special characteristic of approximately constant measuring accuracy over a substantial range allows the same press force sensor to be used for a wide spectrum of forces. The feasibility of switching measuring range when using suitable amplifiers (such as the ICAM Type 5073A...) bolsters this advantage while accommodating the general trend towards production and measuring stations handling a greater variety of parts. However, the wide-range measuring chain also offers critical advantages in laboratory applications, where frequent changes of sensor are the order of the day. And the extremely high degree of overload protection obviates involved protective measures when using the lowest measuring ranges.

Fig. 1: Calibrating element with force distributing cap, flange and cable protector

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Technical data

Press Force Sensor	Type	9323AAA	9323AA	9323A	9333A	9343A	9363A	9383A	9393A
Measuring range F_z	kN	0 … 5	0 … 10	0 … 20	0 … 50	0 … 70	0 … 120	0 … 300	0 … 700
Overload F_z	kN	5.5	12	24	60	84	144	360	840
Measuring ranges, calibrated F_z 100 %	kN	0 … 5	0 … 10	0 … 20	0 … 50	0 … 70	0 … 120	0 … 300	0 … 700
10 %	kN	0 … 0.5	0 … 1	0 … 2	0 … 5	0 … 7	0 … 12	0 … 30	0 … 70
1 %	kN	0 … 0.05	0 … 0.1	0 … 0.2	0 … 0.5	0 … 0.7	0 … 1.2	0 … 3	0 … 7
0.1 %	kN	0 … 0.005							
Max. tension force	kN	0 … –1	0 … –1	0 … –2	0 … –5	0 … –10	0 … –20	0 … –50	0 … – 140
Sensitivity, F_z	pC/N	–33	–9.6	–3.9	–3.9	–3.9	–3.8	–1.9	–1.9
Linearity incl. Hysteresis [1]	%FSO	≤±0.5 [2]							
Repeatability	%FSO	0.02	0.03	0.02	0.03	0.01	0.01		
Preload force Fv	kN	8.5	8.5	8.5	15	25	80	250	450
Torque max. ($F_{x,y}$ = 0, F_z = 0), M_z	N·m	5	5	5	14	31	145	783	1 980
Bending moment max. $M_{x,y}$ F_z = 100%	N·m	0.9	0.9	0.9	10	10	232	972	1 100
F_z = 0%	N·m	14	23	23	65	135	638	3.407	9 940
Shear force max. [3] $F_{x,y}$ (F_z = 0)	kN	0.48	0.62	0.62	1	1.8	5.8	16.9	31.4
Crosstalk (typical) $F_{x,y} \rightarrow F_z$	N/N	≤±0.05 [4]	≤±0.05	≤±0.03	≤±0.03	≤±0.07	≤±0.06	≤±0.02	≤±0.02
$M_{x,y} \rightarrow F_z$	N/N·m	≤±0.5 [4]	≤±0.5	≤±0.5	≤±0.3	≤±0.3	≤±0.3	≤±0.3	≤±0.3
Rigidity c_z (F_z)	kN/µm	≈1,0 [4]	≈1,3	≈1,2	≈2,3	≈2,6	≈4,4	≈7,9	≈10,0
Natural frequency, f_n (F_z)	kHz	>70 [4]	>74.5	>72	>55	>47	>35	>17	>11.3
Operating temperature	°C	–40 … 80	–40 … 120						
Temperature coefficient of sensitivity, F_z	%/°C	0.02	0.05	–0.02					
Insulation resistance at 23°C	Ω	≥1·10^{13}	≥5·10^{13}						≥10^{13}
Capacity C	pF	≈202	≈68	≈29	≈55	≈65	≈150	≈790	≈890
Connector		KIAG 10-32 neg.							
Protection class EN60529 with connected cable	IP	65							
with cable Type 1983AD… and welded sensor	IP	67							
Case material	DIN	1.4542							
Weight	g	48	50	47	137	240	800	6.490	1.8663
Tightening torque. max., M_A									
M3	N·m	1	1	1					
M4	N·m				2				
M5	N·m					4			
M8	N·m						21		
M12	N·m							75	
M16	N·m								150

[1] Refering to FSO of the calibrated (!) measuring range
[2] For sub-range 0.1% determined only for ascending curve, without hystheresis
[3] Corresponds to lateral force at the flange
[4] Calculated value

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General mounting instructions

- The flange bearing surfaces that transmit the force to the sensor must be kept flat and free from dirt and grease
- The centering seats on both ends of the sensor allow very accurate coaxial mounting using the supplied centering rings.
- The sensor can be mounted using the central female thread or tapped holes of the pitch circle.
- Do not exceed the bending moments, torques and shear force specified in the table.
- Whenever possible the force should be transferred axially rather than laterally.
- See pages 4 and 5 for other mounting options.

Customized measuring range

Types 9383A and 9393A can also be customized prestressed. The measuring range can thus be designed for a specific tension-/pressure range. The type designation for the customer specific sensors will be extended with U0109.

Technical data

Press Force Sensor	Type	9383AU0109	9393AU0109
Compression force:			
Measuring range Fz, max	kN	–50 … 500 a)	–100 … 950 b)
Overload Fz, max.	kN	–55/550	–110/1 045
Calibrated Range Fz	kN	customized	customized
Linearity incl. Hysteresis	%FSO	≤±1	≤±1

a) Minimal pretension: F_{v1} = 100 kN at max. compression force of Fz = 500 kN
b) Minimal pretension: F_{v1} = 200 kN at max. compression force of Fz = 950 kN

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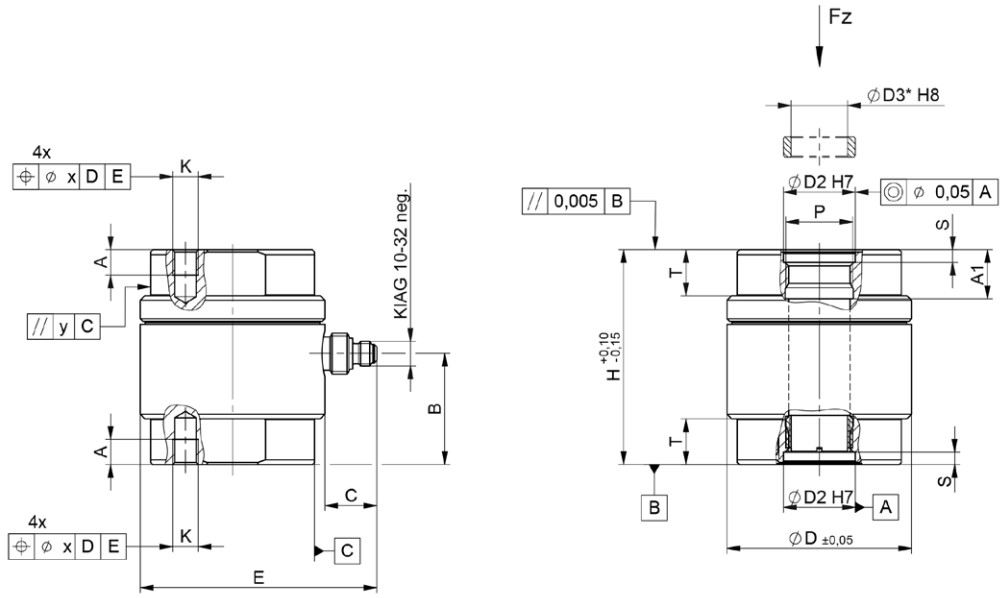
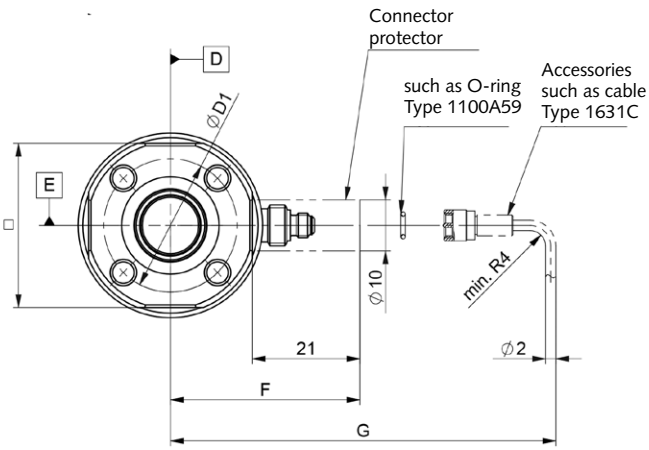
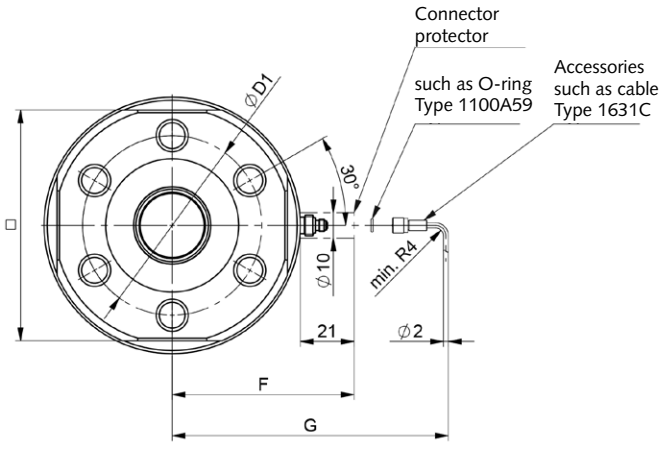
Dimensions Type 9323A/AA/AAA … 9383A





Type 9323A/9333A/9343A/9363A



Type 9383A

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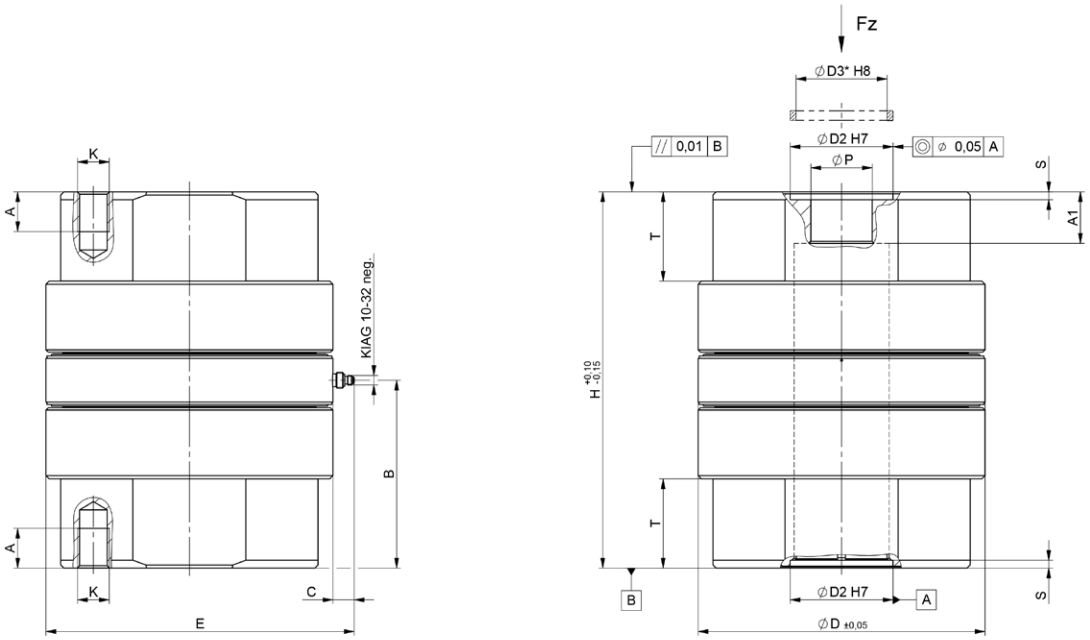
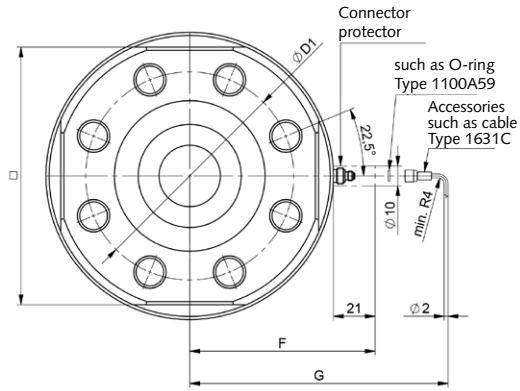
Dimensions Type 9393A





Dimensions in mm

Type	D	D1	D2	D3*	□	H	A	A1	B	C	E	F	G	K	P	T	S	x	y
9323A/AA/AAA	20	14	6	4	17	26	4	7.6	13.3	7.4	27.4	–	36	M3	M5x0.5	6	2.5	0.2	0.1
9333A	30	21	10	8	26	34	4	7.1	16.6	10.2	40.2	36	43.5	M4	M9x0.5	8	2.5	0.3	0.12
9343A	36	26	14	11	32	42	5	9.6	21.7	10.2	46.2	39	46.5	M5	M13x1	9	2.5	0.35	0.15
9363A	54	40	21	17	48	60	8	13.3	32.5	10.4	64.4	48	56	M8	M20x1.5	13	2.5	0.5	0.15
9383A	100	70	30	23.5	90	130	14	24.5	68.6	10.7	110.7	70.7	77.7	M12	S28x2	30	3	–	–
9393A	145	105	52	45.5	130	190	20	26	94.9	10.8	155.8	93.3	131.2	M16	Ø31	45	3	–	–

* Free passage with mounted centering rings

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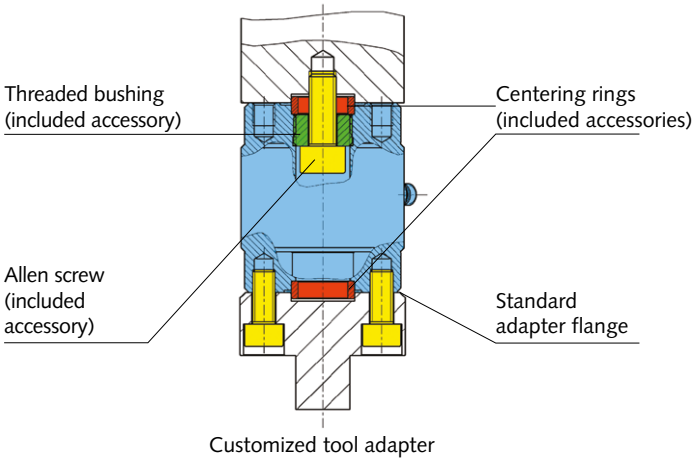
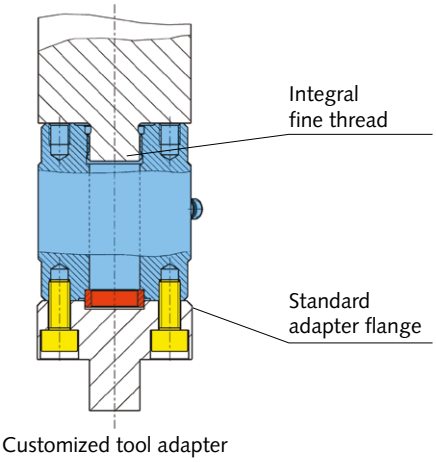
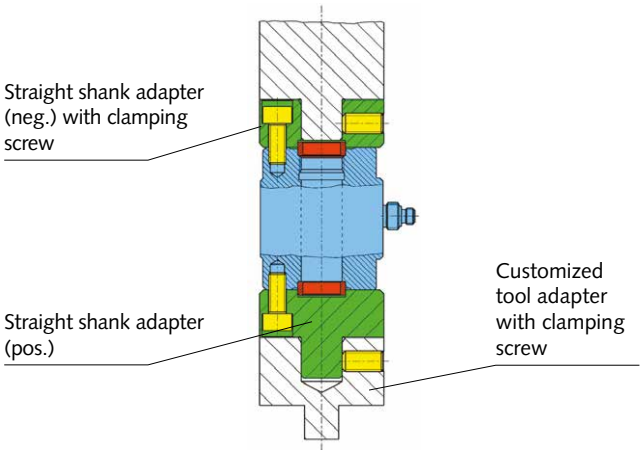
A: Direct mounting using integral mounting screw and threaded bushing



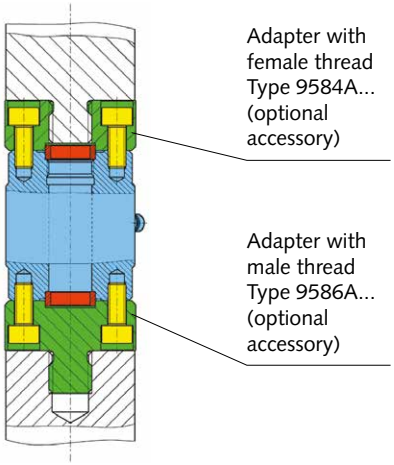
B: Direct mounting using integral fine thread



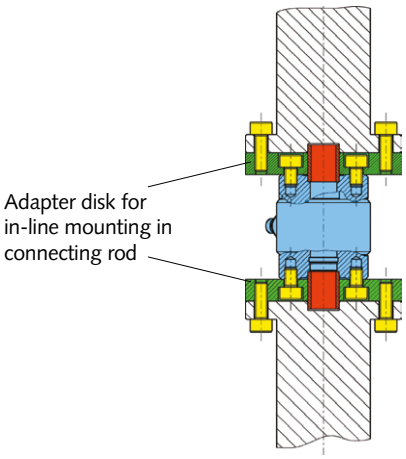
C: Mounting using straight shank adapter



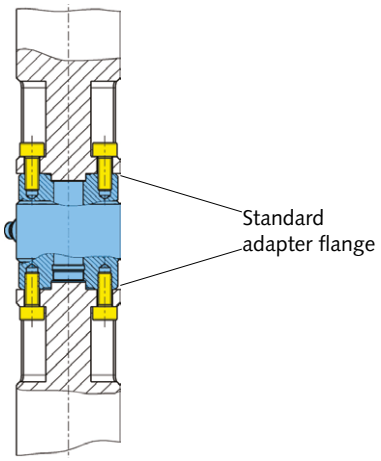
D: Mounting using threaded adapter



E: Mounting using adapter disk/flange



F: Direct mounting using integral flange



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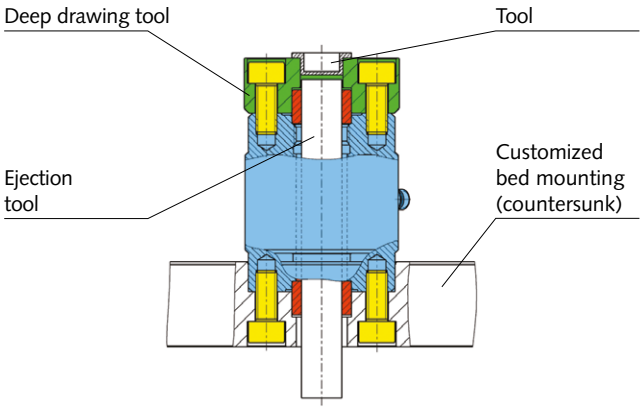
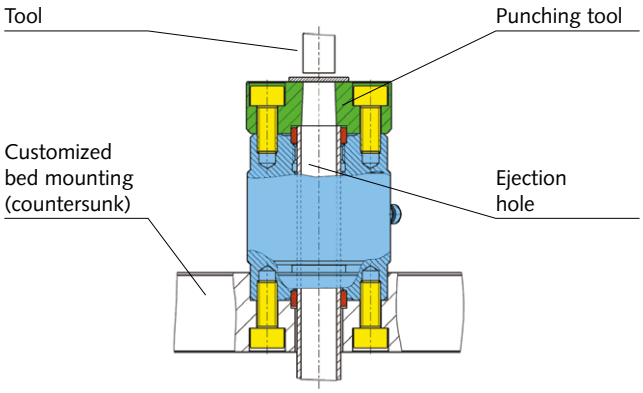
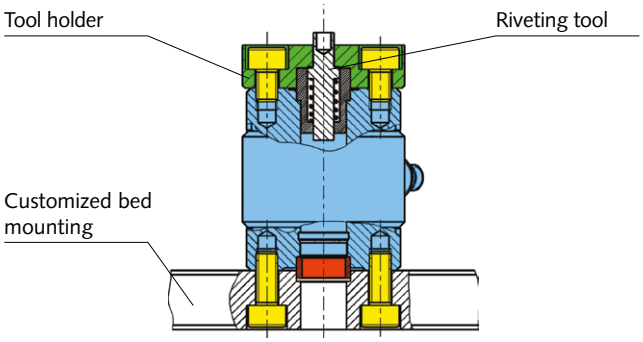
G: Adapter for deep drawing tool with central ejection tool



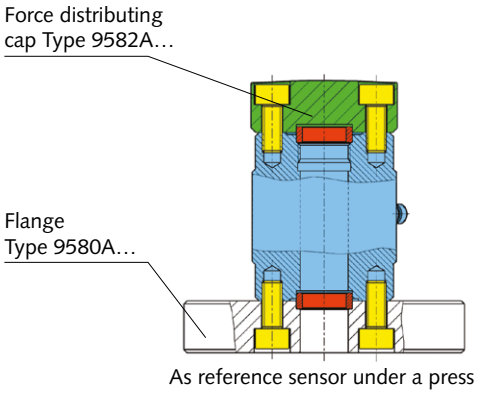
H: Adapter for punching tool with central ejection bore



I: Adapter riveting tool



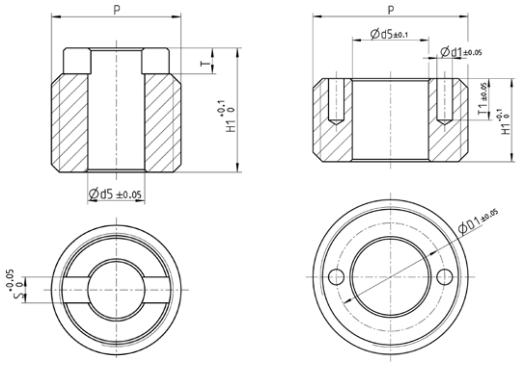
J: Calibrating element with force distributing cap and flange



As reference sensor under a press

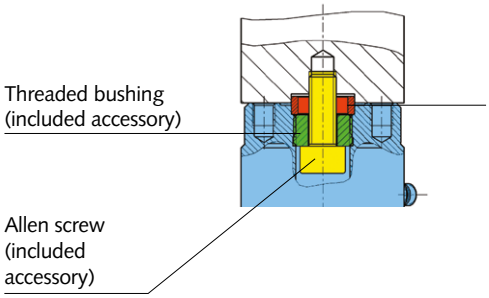
Drawings of mechanical accessories (scope of delivery)

Threaded bushing



Art. No. 3.315.076 Art. No. 3.315.053/054/055/087

Hexagon socket screw



Sensor Type	Art. No	D1	d1	d5	H1	P	T	T1	S
9323A/AA/AAA	3.315.076	–	–	2,2	4,8	M5x0,5	1	–	1
9333A	3.315.053	6,5	1,1	4,3	4,5	M9x0,5	–	3	–
9343A	3.315.054	9,1	1,3	6,4	7	M13x1	–	3,5	–
9363A	3.315.055	14,5	1,6	10,5	10,5	M20x1,5	–	5	–
9383A	3.315.087	21	2,5	16,5	24,5	S28x2-8e	–	5	–
9393A	–	–	–	–	–	–	–	–	–

Sensor Type	Art. No	D1
9323A/AA/AAA	6.120.235	M2x12
9333A	6.120.102	M4x12
9343A	6.120.122	M6x18
9363A	6.120.066	M10x25
9383A	55075248	M16x50
9393A	6.120.136	M30x60

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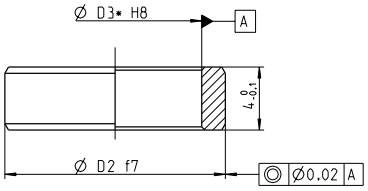
Centering ring

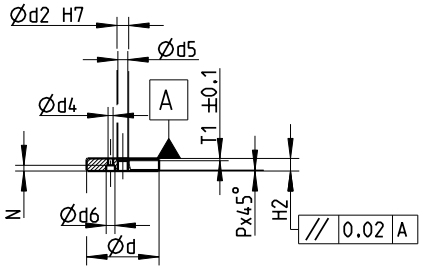


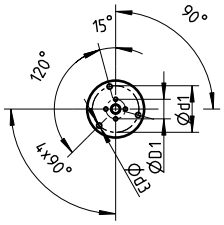
Sensor Type	Art. No.	D2	D3*
9323A/AA AAA	3.420.196	6	4
9333A	3.420.179	10	8
9343A	3.420.180	14	11
9363A	3.420.181	21	17
9383A	3.420.197	30	23,5
9393A	3.420.280	52	45,5

* Free passage with mounted centering rings

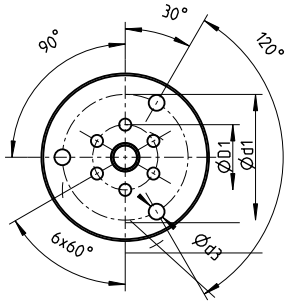
Drawings of mechanical accessories (optional)

Flange

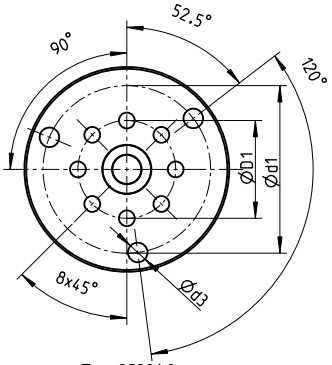




Type 9580A9/A0/A1/A2



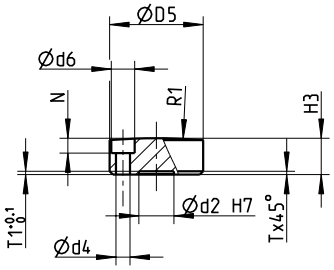
Type 9580A4

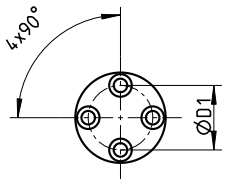


Type 9580A6

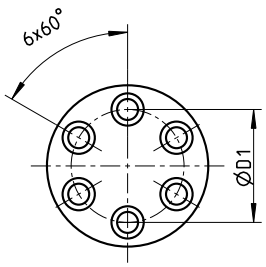
Sensor Type	Flange Type	D1	d	d1	d2	d3	d4	d5	d6	H2	T1	N
9323A/AA/AAA	**9580A9**	14	40	30	6	4,5	3,2	4,5	5,6	8	2	3
9333A	**9580A0**	21	62	50	10	5,5	4,3	8,5	7,5	11	2	5
9343A	**9580A1**	26	70	55	14	6,6	5,3	12	9	13	2	6
9363A	**9580A2**	40	100	78	21	13,5	8,4	18	14	22	2	9
9383A	**9580A4**	70	180	135	30	17	13	25	20	30	2,5	13
9393A	**9580A6**	105	220	180	52	21	17	31	26	48	2,5	17

Force distributing cap

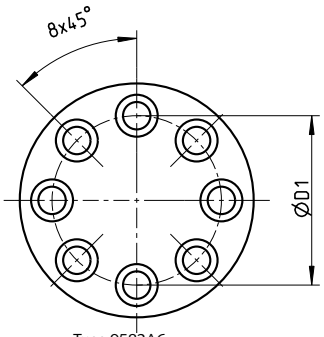




Type 9582A9/A0/A1/A2



Type 9582A4



Type 9582A6

Sensor Type	Force Distr. Cap Type	D1	D5	d2	d4	d6	H3	T1	N	R1
9323A/AA/AAA	**9582A9**	14	20	6	3,2	5,6	8,5	2	3,5	200
9333A	**9582A0**	21	30	10	4,3	7,5	11	2	5	250
9343A	**9582A1**	26	36,5	14	5,3	9	13	2	6	300
9363A	**9582A2**	40	56	21	8,4	14	22	2	9	350
9383A	**9582A4**	70	100	30	13	20	50	2,5	13,5	550
9393A	**9582A6**	105	145	52	17	26	80	2,5	19	850

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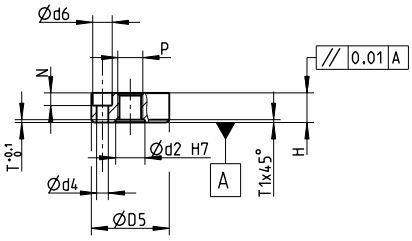
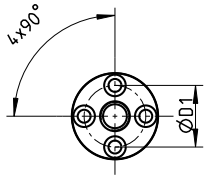
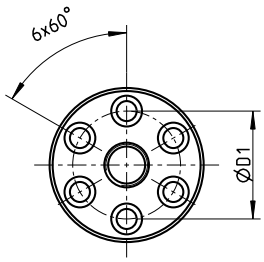
Adapter with female thread

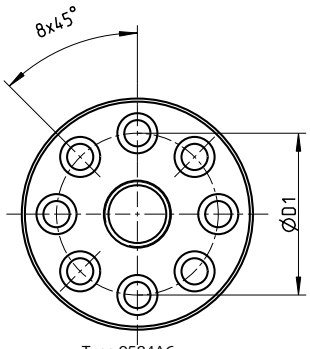




Type 9584A9/A0/A1/A2



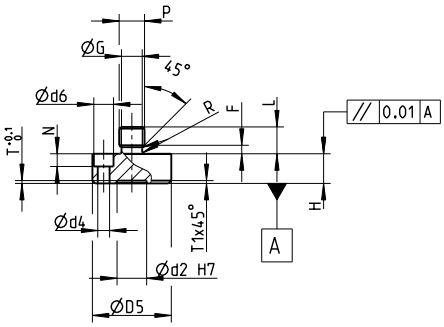
Type 9584A4

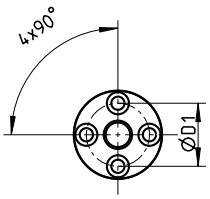


Type 9584A6

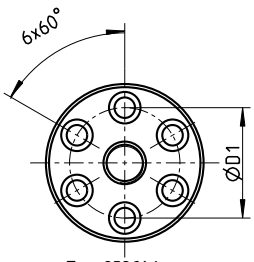
Sensor Type	Adapter Type	D1	D5	d2	d4	d6	H	N	P	T
9323A/AA/AAA	**9584A9**	14	20	6	3,2	5,6	8	3	M4	2
9333A	**9584A0**	21	30	10	4,3	7,5	11	5	M8	2
9343A	**9584A1**	26	36,5	14	5,3	9	14	7	M12	2
9363A	**9584A2**	40	56	21	8,4	14	21	9	M18	2
9383A	**9584A4**	70	100	30	13	20	30	13,5	M27	2,5
9393A	**9584A6**	105	150	52	17	26	48	17	M42	2,5

Adapter with male thread

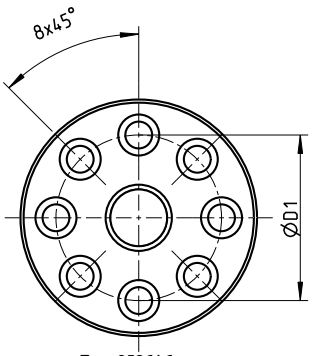




Type 9586A9/A0/A1/A2



Type 9586A4



Type 9586A6

Sensor Type	Adapter Type	D1	D5	d2	d4	d6	H	N	P	L	T
9323A/AA/AAA	**9586A9**	14	20	6	3,2	5,6	8	3	M4	5	2
9333A	**9586A0**	21	30	10	4,3	7,5	11	5	M8	9	2
9343A	**9586A1**	26	36,5	14	5,3	9	14	7	M12	12	2
9363A	**9586A2**	40	56	21	8,4	14	21	9	M18	19	2
9383A	**9586A4**	70	100	30	13	20	30	13,5	M27	26	2,5
9393A	**9586A6**	105	150	52	17	26	48	17	M42	43	2,5

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KISTLER
measure. analyze. innovate.

Electrical connection

We recommend using Kistler cables exclusively to prevent insulation resistance, triboelectricity and cable breakage problems from the outset.

Sensor
Type 9323A ... 9393A

Connecting cable
Type 1631C…

Charge amplifier
Type 5073A111 [2)]

maXYmos
Type 5867B… [2)]

Ordering code **Included accessories**	**Type/Art. No.**
Press Force Sensor F_z 0 ... 5 kN	**9323AAA**
• Threaded bushing	3.315.076
• Socket head cap screw M2x12	6.120.235
• Centering ring (x2)	3.420.196
Press Force Sensor F_z 0 … 10 kN	**9323AA**
• Threaded bushing	3.315.076
• Socket head cap screw M2x12	6.120.235
• Centering ring (x2)	3.420.196
Press Force Sensor F_z 0 … 20 kN	**9323A**
• Threaded bushing	3.315.076
• Socket head cap screw M2x12	6.120.235
• Centering ring (x2)	3.420.196
Press Force Sensor F_z 0 … 50 kN	**9333A**
• Connector protector	3.414.366
• Threaded bushing	3.315.053
• Socket head cap screw M4x12	6.120.102
• Centering ring (x2)	3.420.179
Press Force Sensor F_z 0 … 70 kN	**9343A**
• Connector protector	3.414.366
• Threaded bushing	3.315.054
• Socket head cap screw M6x18	6.120.122
• Centering ring (x2)	3.420.180
Press Force Sensor F_z 0 … 120 kN	**9363A**
• Connector protector	3.414.366
• Threaded bushing	3.315.055
• Socket head cap screw M10x25	6.120.066
• Centering ring (x2)	3.420.181
Press Force Sensor F_z 0 … 300 kN	**9383A**
Press Force Sensor [1)]	**9383AU0109**
• Connector protector	3.414.366
• Threaded bushing	3.315.087
• Socket head cap screw M16x50	55075248
• Centering ring (x2)	3.420.197
Press Force Sensor Fz 0 … 700 kN	**9393A**
Press Force Sensor [1)]	**9393AU0109**
• Connector protector	3.414.366
• Socket head cap screw M30x40	6.120.136
• Centering ring (x2)	3.420.280

[1)] Measuring and calibrated range customer-specific, on request

Optional accessories	**Type**
• Connecting cable, KIAG 10-32 pos. – BNC pos.	1631C…
• Connecting cable, KIAG 10-32 pos. – TNC pos.	1633C…
• Connecting cable, KIAG 10-32 pos. – KIAG 10-32 pos.	1635C…
• Connecting cable, KIAG 10-32 pos. int. – BNC pos.	1939A…
• Connecting cable, KIAG 10-32 pos. int. – TNC pos.	1941A…
• Connecting cable, KIAG 10-32 pos. – KIAG 10-32 pos.,with metal sheath	1957A
• Connecting cable, KIAG 10-32 pos. – KIAG 10-32 pos., with robust metal sheath	1900A21A11...
• Connecting cable, KIAG 10-32 pos. – BNC pos., with robust metal sheath	1900A21A12...
• Connecting cable, KIAG 10-32 pos. – KIAG 10-32 pos., highly flexible, suitable for drag chains	1900A23A11...
• Connecting cable, KIAG 10-32 pos. – BNC pos., highly flexible, suitable for drag chains	1900A23A12...
• Flange	9580A…
• Force distributing cap	9582A…
• Adapter with female thread	9584A…
• Adapter with male thread	9586A…
• SCS calibration	9961F-AC

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